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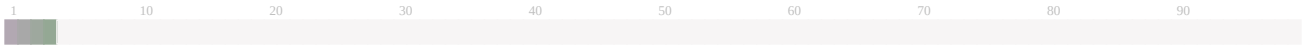

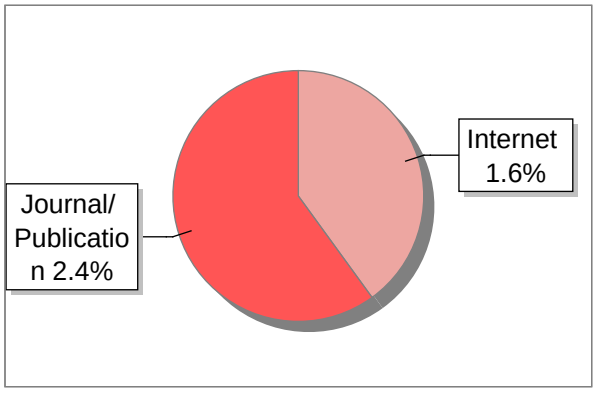

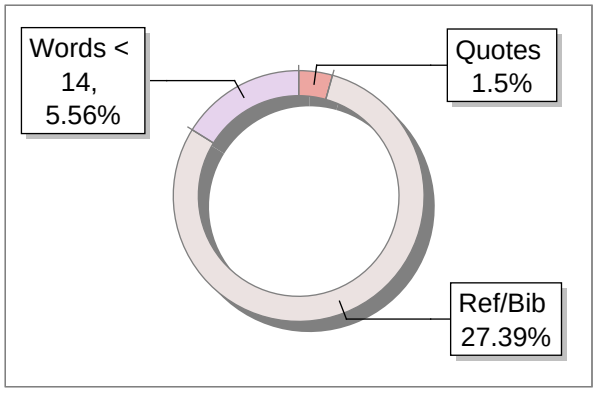

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DEVELOPMENT OF DISABILITY ASSESSMENT SCALE FOR UPPER LIMB IN HEMIPLEGIC PATIENTS

A SYNOPSIS

Submitted for the Registration for the Degree

of

Doctor of Philosophy

in the

PHYSIOTHERAPY
Faculty of Physiotherapy and Allied Health Science

by

Surender

(Regn. No: SVSU/Ph.D./45507)
Enrollment Number: 2203000002603

Under the Supervision of

Prof. (Dr.) Jasmine Anandabai

Faculty of Physiotherapy & Allied Health Sciences
Jyotirao Phule Subharti College of Physiotherapy
Swami Vivekanand Subharti University
(NAAC Accredited grade "A" University)
Subhartipuram, NH-58, MEERUT-25005
(Year 2022-2023)

1 Introduction

Background:

Hemiplegia is one of the leading causes of disability. Impaired upper limb function is a typical occurrence, with shoulder issues accounting for the majority of upper extremity difficulties. Due to its great mobility and decreased stability, the shoulder is prone to a variety of secondary musculoskeletal issues following a stroke, including discomfort, subluxation, and limited joint range of motion. One of the most frequent medical issues following a stroke is hemiplegic shoulder pain (HSP), which has a reported incidence of 1.6 to 40% (1, 2). Stroke is becoming more common in India, where it is now one of the major causes of limb dysfunction and the high prevalence of disability in our nation. Therefore, even if a patient recovers from a stroke, disability may still result. Additionally, the disease is starting at a younger age and getting worse every year, which has had a major negative impact on people's physical and mental health. Currently, there is a dearth of really effective treatments. As a result, it is thought that early prevention is an excellent way to stop strokes before they start. This study examines and contrasts the effects of hand-intensive exercise on the function of the upper limbs of stroke hemiplegic patients' left and right. Painful injuries, nerve lesions, immobilization of the extremities, stroke, spinal cord injury, or myocardial infarction are the causes of complex regional pain syndrome (CRPS), formerly known as reflex sympathetic dystrophy and causalgia (3). Up to 55–75% of stroke survivors have varied degrees of motor dysfunction in their upper limbs, which has a major negative impact on the patient's independence in everyday activities and places a significant financial strain on families and society. Therefore, it is crucial to improve these patients' limbs' motor function, particularly in the upper limbs. Nonetheless, the rehabilitation process is challenging and requires time.Furthermore, stroke patients frequently experience attention problems and a slowing down of their information processing speed, which

might have an impact on their functional results and rehabilitation process. The amount of time required to regain motor function rises with attention deficit. Thus, it is imperative to find solutions to the pressing issues of positive and thorough rehabilitation techniques as well as quickening the recovery process for stroke victims. (4, 5, 6, 7)

Out of 34–85% of stroke survivors, shoulder problems are a common consequence. Ten days after the stroke, shoulder issues begin to appear, being most noticeable between two and four months later. Post-stroke shoulder problems commonly encountered are discomfort (85%), subluxation (84%), impingement, frozen shoulder, reflex sympathetic dystrophy, spastic shoulder, and so on. Due to its harshness, 12 therapeutic therapies have to be examined to studies' effectiveness. (8, 9)

For this reason, a credible and trustworthy outcome measure is required to calculate the shoulder problem following a stroke. Both hand function and the complete upper extremities are currently included in the stroke outcome assessments that are accessible. Stroke patients are not the target audience for the shoulder disability scores that are currently being used in studies.

1.1 Statement of Problem

It is important to construct a scale on hemiplegic upper limb that will include all associated items and domains because there is now no specific check list for hemiplegic upper limb, even the available upper extremity scale could not cover all the domains of hemiplegic shoulder.

1.2 Purpose/ Need of the study

The purpose of the research is to create an upper limb disability questionnaire that is particular to hemiplegic patients and includes questions about hemiplegic shoulder pain, subluxation, range of motion, activities of daily living, hand function and quality of life.

1.2 Objective of the study

1.2.1 Development of disability assessment scale for upper limb in hemiplegic patients

using different parameters.

1.2.2 Validation and reliability of above developed assessment scale for improving diagnosis.

1.2.3 Inter and Intra rater and test-retest reliability of above developed assessment scale.

2. Review of Literature:

This chapter, the review of literature discusses the many scales designed for individuals with upper extremity and hemiplegic shoulder disorders along with associated complications.

Jia F, Zhu in conducted a study in year, 2023 on Stiffness changes in internal rotation muscles of the shoulder and its influence on hemiplegic shoulder pain. The results of this study differ from those of previous studies pertaining to hemiplegic limbs. H. et al. and Wandklyn, P. et al. found that the temperature and blood flow of the hand in the hemiplegic side decreased by using the Plethysmograph. WC Adams et al. found that the blood flow of the affected and non-affected feet in the stroke patients was lower than that in the control subjects. They concluded that the reduction of blood flow in hemiplegic limb was likely caused by muscle atrophy. (10)

Feng J, Shen conducted a study in year, 2022 to find out how well hand functions in kids with hemiplegic cerebral palsy are affected by core stability exercises. According to this study, hand functions in children with hemiplegic cerebral palsy may be improved by core stability exercises, which can be an effective remedy. (11)

de Sire A, Moggio L, Demeco, 2022 concluded that complete loss of motor function in the afflicted arm and glenohumeral subluxation have been identified as often reported risk factors for HSP, despite methodological limitations. It will take better planned cohort studies to investigate the risk factors for Hemiplegic Shoulder Pain. (12)

Sui M, Jiang N, Yan ,2022 stated that one of the four most frequent medical consequences following a stroke is hemiplegic shoulder pain (HSP), with reported incidences ranging from 30 to 65% depending on the population investigated and the technique of assessment used. Nearly a third of stroke survivors experienced shoulder pain within six months of their stroke, and 65% of these patients still had the issue many months later, according to various prospective studies. It is believed that treatment-resistant structural injuries and aberrant posture of the hemiplegic shoulder, which destroys the surrounding tissues, are the causes of chronic HSP, which can develop over time. HSP

is linked to lower quality of life, greater rates of depression, difficulty with rehabilitation, and decreased functional use of the arm .(13)

Chiu YH, Chang et. al 2021,stated that suprascapular nerve blocks was expected to rank first in treating HSP at the fourth post-treatment week, according to the current systematic review and meta-analysis, even if there was only a 50% chance that it would be the best treatment. Additionally, caution should be exercised because of its brief period of efficacy and the paucity of trials comparing SSNB to alternative injectable regimens in head-to-head comparisons. The most effective course of treatment appears to be intramuscular BoNT injections during the four to twenty-four week post-injection interval. In order to effectively treat concurrent spasticity in the shoulder girdle muscles, intramuscular BoNT injections should be used as a possible source of HSP. (14)

Yang Y, Pan et. al, 2021 concluded the proof-of-concept findings revealed that rTMS in conjunction with hand grip training was a novel strategy to support stroke patients' hand functional recovery. It supplied crucial data for planning a comprehensive, multi-center clinical trial to show off the effectiveness of combining central and peripheral stimulation even more. (15)

Saetta G, Michels et. al, 2021 in their study concluded that the left secondary somatosensory cortex was not related to the damaged hand somatosensory network. Our findings connect the activity of critical hubs for integrating the multimodal signals of the afflicted hand with the productive component of somatoparaphrenia. Moreover, findings offer the first concrete evidence in favor of the “left narrator model” (Halligan et al., 1995), which postulates that somatoparaphrenia confabulations result from a separation of left hemisphere language regions from right hemisphere parieto-temporal cortex. (16)

Farag SM, Mohammed et. al ,2020 stated that ,Botulinum toxin randomized controlled trials Variable outcome measures were utilized in the injectable treatment of upper limb spasticity in children with cerebral palsy, with inconsistent outcomes. Overall, some data suggests that botulinum toxin A may be used as a short-term adjuvant treatment to physical therapy regimens or as a placebo to lessen spasticity. The data supporting its use as an adjuvant treatment to enhance upper limb function or quality of life is inadequate. The risks were manageable and did not offset the therapeutic benefits. (17)

Alanbay E, Aras B, Kesikburun et al 2020, findings of their study support the superior advantages of evidence-based nursing for stroke patients who have hemiplegia, however there are also drawbacks. They didn't check in with the patients after they were discharged. The prognosis of patients may not be affected by evidence-based nursing, and patient compliance in the two groups has not been assessed, which could have an impact on the research findings. As a result, in order to improve this research in the future, we will supplement this section. In conclusion, this study has shown that evidence-based nursing is worthy of clinical promotion since it can successfully improve limb function, reduce the likelihood of complications, and improve the quality of life for patients who have hemiplegia following a stroke.(18)

Mc Glinchey MP et al, 2020 concluded about the application of rehabilitation therapies to enhance physical function and lessen problems associated with immobility following a major stroke is not well supported by high-quality research. Future studies are needed to examine rehabilitation strategies that are more widely adopted, especially to lessen the consequences that follow a stroke. (19)

Seephim B, Srisoparb et al, 2020 stated about the People with chronic stroke who lived in the community showed a decline in their hemiplegic sides upper limb functions. The majority of patients suffered from upper limb difficulties, including issues related to their shoulders. Therefore, to improve upper limb recovery in the hemiplegic side, therapy must continue after hospital discharge. (20)

Duray M, Baskan et al, 2020 in their study stated that one of the primary determinants of proprioceptive capacity and upper extremity motor function at various angles is the presence of HSP. Proprioceptive acuity and motor performance can improve with HSP management, which can have a major impact on sensorimotor integration. (21)

Huang YC, et al ,2019 in their study " Effects of kinesio taping on hemiplegic hand in patients with upper limb post-stroke spasticity: a randomized controlled pilot study" concluded that Kinesio taping could provide some benefits in reducing spasticity and in improving motor performance on the affected hand in patients with sub-acute stroke.(22)

Cho S, Kim WS, Paik NJ, Bang H., 2015 in their study "Upper-limb function assessment using VBBTs for stroke patients" concluded that planning an efficient patient's rehabilitation requires

assessing and measuring upper-limb functions. Previous research has shown the value of the box and block test (BBT), a traditional, straightforward, and uncomplicated evaluation instrument used in hospitals for stroke rehabilitation. The authors created a virtual box and block test (VBBT) system for hand, finger, and gripping assessments using a traditional depth-sensing camera. This system is based on the BBT utilized for the hospital's grasping ability exam. One of the main elements of a home-based virtual rehabilitation system might be a virtual upper-limb function assessment instrument that can be used in a household environment. The results of comparing the real and virtual BBTs demonstrate the potential for virtualizing traditional and unsupervised evaluations. (23)

3. Methodology

3.1 Study design

Longitudinal Cross sectional study.

3.2 Study setting

Multi centric study setting.

3.3 Selection criteria

3.3.1 Inclusion criteria

1. Patients with Hemiplegia
2. Age range between 40-70 years.
3. Both the genders
4. Patients who can follow simple command.
5. Patients with Mini Mental State examination score >23.

3.3.2 Exclusion Criteria

1. Patients with Mini Mental State examination score <23
2. Other musculoskeletal disorder of the affected upper extremity.
3. History of trauma to the affected upper extremity.
4. Individuals with history of multiple stroke.
5. Patient suffering from other neurological disorder.

3.4 Procedure

This is a cross sectional longitudinal study of tool development along with analysis of psychometric properties. The draft of procedure will be approved by the ethical review committee of Swami Vivekanad Subharti University. The study consist of scale domains and item generation, content validation, pilot testing, final draft, reliability testing.

3.4.1 Domain and item generation

A literature search and face-to-face patient interviews will be used to produce the domain and item associated with pain, subluxation, ROM, ADLs, and quality of life.

3.4.1.1 Literature search

Using the terms "stroke," "hemiplegia," "upper limb recovery," "hemiplegic hand," "stroke specific quality of life," "shoulder subluxation," "upper limb disability scale in stroke," and "ADL scales in stroke," the literature will be searched in PubMed , Scopus, and the Cochrane library.

3.4.1.2 Direct Interview

The primary researcher will interview 30 patients, asking them to provide items associated with pain, subluxation, range of motion, activities of daily living, and quality of life. Individuals are urged to complete as many items as possible that they believe pertain to their current situation. Participants will request to add more items that are not covered in the literature to a list of items that the lead researcher will produce based on the literature search.

3.4.1.3 Content validation

A panel of ten experts will get a draft of the scale. The level of agreement as a percentage will be 70%. Items that don't receive 70% agreement will be removed.

3.4.1.4 Pilot testing

The scale will be used in a pilot study to determine its practical practicality and any obstacles after the content has been validated.

3.4.1.5 Final draft

After the pilot study, final draft will be prepared.

3.4.1.6 Reliability testing

Test retest reliability will be checked by one ratter in two different occasion

PHASES OF THE STUDY

4:

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4 Data Analysis

Data analysis will be done using the SPSS Software and statistical analysis will be done with following formulas:

Calculation of the content validity ratio (CVR):

The CVR will calculated using the formula

CVR = (Ne – N/2)/ (N/2),

Where Ne is the number of panelists who rated an item as essential (rating 3 or 4), and N is the total number of panelists.

Calculation of the Item Level content validity Index (I-CVI)

The (I-CVI) will be computed by dividing the number of experts who gave each item a rating of 3 or 4 (meaning they thought it was relevant or clear) by the total number of experts.

S-CVI/Ave (scale-level content validity index based on the average method)

S-CVI/Ave = (sum of I-CVI scores)/ (number of item)

S-CVI/Ave = (sum of proportion relevance rating)/ (number of expert)[159]

Percent agreement for Face Validity

Percent agreement will calculated by following formulas:

Equation No.: 1

$(No.\ of\ agreed\ raters\ per\ \ /Total\ number\ of\ ratersper\ question) \times 100\%$

Equation No.: 2

$(Sum\ of\ \%\ of\ all\ queastions/\ Total\ number\ of\ question)$

The strength of full agreement should be determined by analyzing the responses for each question as well as the entire tool.

Reliability measures

We looked for two methods (for all three types):

(1) Relative reliability, this is connected to the degree of correlation with various metrics of different people. The size of the relationship between repeated measurements is referred to as relative reliability.

(2) Absolute reliability. The degree to which repeated measurements differ for people is referred to as absolute reliability; the less they differ, the higher the reliability.

I. Relative reliability: Reliability indices

Intra-class correlation coefficient

The intra-class correlation coefficient will be used to estimate the reliability of a set of ratings.

Spearman Rank Correlation

For quantitative data, such as interval-ratio data, reliability coefficients Pearson product correlation coefficient (r) will be used.

II. Absolute reliability

The degree to which repeated measurements differ for individuals is referred to as absolute reliability; the less they differ, the higher the reliability. The degree of variance in measurement over repeated measurements is measured by absolute reliability. Standard error of measurement (SEM) and minimum detectable change (MDC) should be used to measure the absolute reliability.

a. Standard error of measurement

SEM formula following formula will be used to calculate the response stability of a scientific instrument.

$SEM = SDx \sqrt{1 - Rxx}$

Where, SDx = Pooled standard deviation between two repeated sessions.

It was calculated using the formulae,

$SDx = \sqrt{(SD1)\ 2 - (SD2)}$

Here, SD1 – Standard deviation of the mean of first session

SD2 – Standard deviation of the mean of second session by the same rater under constant testing conditions (test-retest)

b. Scattered Plot

The shape and degree (strength) of a relationship between sessions or observations will be graphically examined using a scatter diagram or scatter plot.

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Annexure:

Certificate of Consent

I have read the foregoing information, or it has been read to me. I have had the opportunity to ask questions about it and any questions that I have asked have been answered to my satisfaction. I consent voluntarily to participate as a participant in this research.

Print Name of Participant_____

Signature of Participant _____

Date _____

Day/month/year

If illiterate

I have witnessed the accurate reading of the consent form to the potential participant, and the individual has had the opportunity to ask questions. I confirm that the individual has given consent freely.

Print name of witness_____ AND Thumb print of Participant

Signature of witness _____

Date _____

Day/month/year

Statement by the researcher/person taking consent

I have accurately read out the information sheet to the potential participant, and to the best of my ability made sure that the participant understands that the following will be done:

1.

2.

3.

I confirm that the participant was given an opportunity to ask questions about the study, and all the questions asked by the participant have been answered correctly and to the best of my ability. I confirm that the individual has not been coerced into giving consent, and the consent has been given freely and voluntarily.

Print Name of Researcher/person taking the consent_____

Signature of Researcher /person taking the consent_____

Date _____

Day/month/year

Name & Signature of the Candidate	
Name and Designation of Guide	
Remark of the Guide & Signature	
Name and Designation of Co-Guide	
Signature of Co- Guide	
Name & Signature of HOD	
Remark of the Principal & Signature	